

Date: Tuesday, 10/06/2008 8:56:39 AM  
 User: Julie Lecocq

5.6

## Process Sheet

<b>Customer</b> :	CU-DAR001 Dart Helicopters Services	<b>Drawing Name</b> :	212/205 HIGH AFT X-TUBE ASSEMBLY
<b>Job Number</b> :	39746		
<b>Estimate Number</b> :	13218		
<b>P.O. Number</b> :		<b>Part Number</b> :	D212664201TRN
<b>This Issue</b> :	10/06/2008	<b>S.O. No.</b> :	
<b>Prsht Rev.</b> :	NC	<b>Drawing Number</b> :	D212-664-241 REV C
<b>First Issue</b> :	1 /	<b>Project Number</b> :	N/A
<b>Previous Run</b> :	39430	<b>Drawing Revision</b> :	C
		<b>Material</b> :	
<b>Written By</b> :		<b>Due Date</b> :	20/06/2008
<b>Checked &amp; Approved By</b> :	JLD 08.06.10	<b>Qty:</b>	1 Um: Each
<b>Comment</b> :	Est Rev:A 08-03-06 new issue DD verified by:ec Est Rev B 08.04.02 Removed polish EC verified DD		

## Additional Product

Job Number:



<b>Seq. #:</b>	<b>Machine Or Operation:</b>	<b>Description :</b>
----------------	------------------------------	----------------------

1.0	D6006129	Crosstube Material
-----	----------	--------------------



**Comment:** Qty.: 1.0000 Each(s)/Unit Total: 1.0000 Each(s)

Pick:

Qty Part number Description Batch

1 D6006-129 Crosstube 026550

Check OD = 3.250"; ID = 2.220"

a.m 08.06.11 ①

2.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
-----	------------	----------------------------



① →

**Comment:** MORI SEIKI CNC LATHE LARGE

1-Fill tube with sand &amp; install plugs DT8534 on both ends as per Folio FA114

2-Turn first side as per Folio FA114

3- File transition lines smooth.

a.m 08.06.12 ①

3.0	QC1	INSPECT ALL DIM TO DIM SHEET
-----	-----	------------------------------

**Comment:** INSPECT ALL DIM TO DIM SHEET

a.m 08.06.12 ①

4.0	MORI SEIKI	MORI SEIKI CNC LATHE LARGE
-----	------------	----------------------------

**Comment:** MORI SEIKI CNC LATHE LARGE

1-Turn second side as per Folio FA114

2- File transition lines smooth.

3-Remove sand and plugs

a.m 08.06.12 ①

Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: D212-664-201TRN PAR #: N/A Fault Category: Rad/x-tube NCR: Yes No DQA: D Date: 08/06/17  
 QA: N/C Closed: D Date: 08/06/17

NCR: <u>39746</u>		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
8/6/12	# 2.0	Durham machining the tube was cut too short <del>to</del> 124.290" instead on 124.360"	<u>UP</u> 08.06.13 per QSI 042	ADJUST TAPER SO THAT RUFFS ARE SHORTER BY 0.030. TUBE ACCEPTABLE. MARGINS STILL POSITIVE. EFFECTIVE WD REDUCED BY 0.001. REF ATTACHED CALCS.	<u>UP</u> 08.06.13 QSI 042	<u>S</u> 08/06/13	<u>UP</u> 08.06.13 per QSI 042	<u>S</u> 08/06/12
		R.C. <del>the</del> operator error.						<u>S</u> 08/06/12

NOTE: Date & initial all entries

Date: Tuesday, 10/06/2008 8:56:39 AM  
User: Julie Lecocq

## Process Sheet

Customer: CU-DAR001 Dart Helicopters Services

Drawing Name: 212/205 HIGH AFT X-TUBE ASSEMBLY

Job Number: 39746

Part Number: D212664201TRN

Job Number:



Seq. #:

Machine Or Operation:

Description :

5.0

QC1

INSPECT ALL DIM TO DIM SHEET



Comment: INSPECT ALL DIM TO DIM SHEET

A.M. 08.06.12 (1)

6.0

QC8

SECOND CHECK



Comment: SECOND CHECK

5 08/06/13 (42)

7.0

HAND FINISHING1

HAND FINISHING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Chemical Conversion Coat as per QSI 005 4.1 within 24 hours of machining

AWM 8-6-13

8.0

QC3

INSPECT POWDER COAT/CHEMICAL CONVERSION



Comment: INSPECT POWDER COAT/CHEMICAL CONVERSION

DP 8-6-13

9.0

PACKAGING 1

PACKAGING RESOURCE #1



Comment: HAND FINISHING RESOURCE #1

Identify and stock in kanban rack

Location:

X-TUBE CELL

AWM 8-6-13

10.0

QC21

FINAL INSPECTION/W/O RELEASE



Comment: FINAL INSPECTION/W/O RELEASE

08/06/16 (9)

Job Completion



u 08.06.13

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>	<b>Work Order:</b> 39746
<b>Description:</b> Crosstube Assembly (205/212 High Aft)	<b>Part Number:</b> D212-664-241
<b>Inspection Dwg:</b> D212-664-241 <b>Rev:</b> C	<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	0.200	+/-0.010	0.200	✓		
	R0.063	+/-0.010	20.063	✓		
	2.990	+0.005/-0.000	2.995	✓		
	5.237	+/-0.030	5.237	✓		
	2.600	+0.005/-0.000	2.605	✓		
	2.686	+0.005/-0.000	2.691	✓		
	2.770	+0.005/-0.000	2.775	✓		
	2.854	+0.005/-0.000	2.858	✓		
	2.938	+0.005/-0.000	2.942	✓		
	3.021	+0.005/-0.000	3.026	✓		
	3.133	+0.005/-0.000	3.134	✓		
	3.179	+0.005/-0.000	3.182	✓		
SIDE B	0.200	+/-0.010	0.200	✓		
	R0.063	+/-0.010	20.063	✓		
	2.990	+0.005/-0.000	2.995	✓		
	5.237	+/-0.030	5.237	✓		
	2.600	+0.005/-0.000	2.605	✓		
	2.686	+0.005/-0.000	2.691	✓		
	2.770	+0.005/-0.000	2.775	✓		
	2.854	+0.005/-0.000	2.858	✓		
	2.938	+0.005/-0.000	2.942	✓		
	3.021	+0.005/-0.000	3.026	✓		
	3.133	+0.005/-0.000	3.134	✓		
	3.179	+0.005/-0.000	3.182	✓		
	124.36	+/-0.020	124.290			* See photo on first page
						05/06/13

<b>Measured by:</b> am	<b>Audited by:</b> [Signature]	<b>Prototype Approval:</b>	N/A
<b>Date:</b> 08.06.12	<b>Date:</b> 05/06/13	<b>Date:</b>	N/A

Rev	Date	Change	Revised by	Approved
A	05.04.27	New Issue (P/O D412-664-201)	KJ/JLM	
B	06.03.09	Tolerance for 5.237 was +/-0.001	KJ/JLM	
C	07.05.08	Dwg Rev. updated	KJ/JLM	[Signature]



DESIGN <i>PH</i>	DRAWN BY <i>PH</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <i>[Signature]</i>	APPROVED <i>[Signature]</i>	DRAWING NO. D212-664-241	REV. C SHEET 1 OF 3
DATE 07.03.08		TITLE CROSSTUBE ASS'Y (205/212 HI AFT) NTS	
A	00.12.12	NEW ISSUE	
B	05.02.04	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	
C	07.03.08	REMOVE -1009 ABRASION STRIP; ADD MAGNOBOND 6398, CUSHION, REVERSE CLAMPS	

**RELEASED**  
*07.04.24*  
PER E.N. 289

Qty	Part Number	Description
X	D212-664-241	CROSSTUBE ASSEMBLY (205/212 HIGH AFT)
1	D6006-129	CROSSTUBE
2	D2940-1	SUPPORT
4	D3595-063-530	RUBBER CUSHION
4	MS21920-28	CLAMP (OR MS21920-30)
A/R	MAGNOBOND 6398	ROCKWELL SPECIFICATION RBO-120-023 ADHESIVE (TEXTRON/BELL SPEC. 299-947-100, TYPE II, CLASS 2 ADHESIVE)

#### GENERAL NOTES:

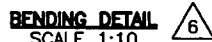
- 1) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED
- 2) MATERIAL: MANUFACTURED FROM D6006-129  
FINISHED LENGTH = 124.36±0.020
- 3) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 4) PART IS SYMMETRIC ABOUT CENTERLINE
- 5) RUN-OFF PART. BLEND OUT EDGE LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.
- 6) BEND PROGRESSIVELY WITH A MINIMUM OF 5 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 7) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038.
- 8) SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS.
- 9) INSTALL D2940-1 SUPPORT USING 0.03" TO 0.06" THICK LAYER OF MAGNOBOND 6398 PER QSI 015. LET CURE FOR 12 HOURS AFTER INSTALLATION AND PRIOR TO PACKAGING.
- 10) INSTALL MS21920-28 CLAMPS WITH D3595-063-530 RUBBER CUSHIONS TO SECURE D2940-1 SUPPORT ON TOP SIDE OF CROSSTUBE. ENSURE CLAMPS ARE OPPOSITE OF CROSSTUBE SUPPORT  
**NOTE:** MS21920-30 CLAMPS CAN BE USED TO ACCOMMODATE VARYING DIAMETERS. ENSURE THERE IS A MINIMUM OF 1.5 THREADS IN SAFETY ON THE NUTS.
- 11) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE.
- 12) TORQUE CLAMPS 80 TO 100 IN-LB.

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 39746

Copyright © 2000 by DART AEROSPACE LTD

THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.

07.04.24 g  
PER FIRMATA

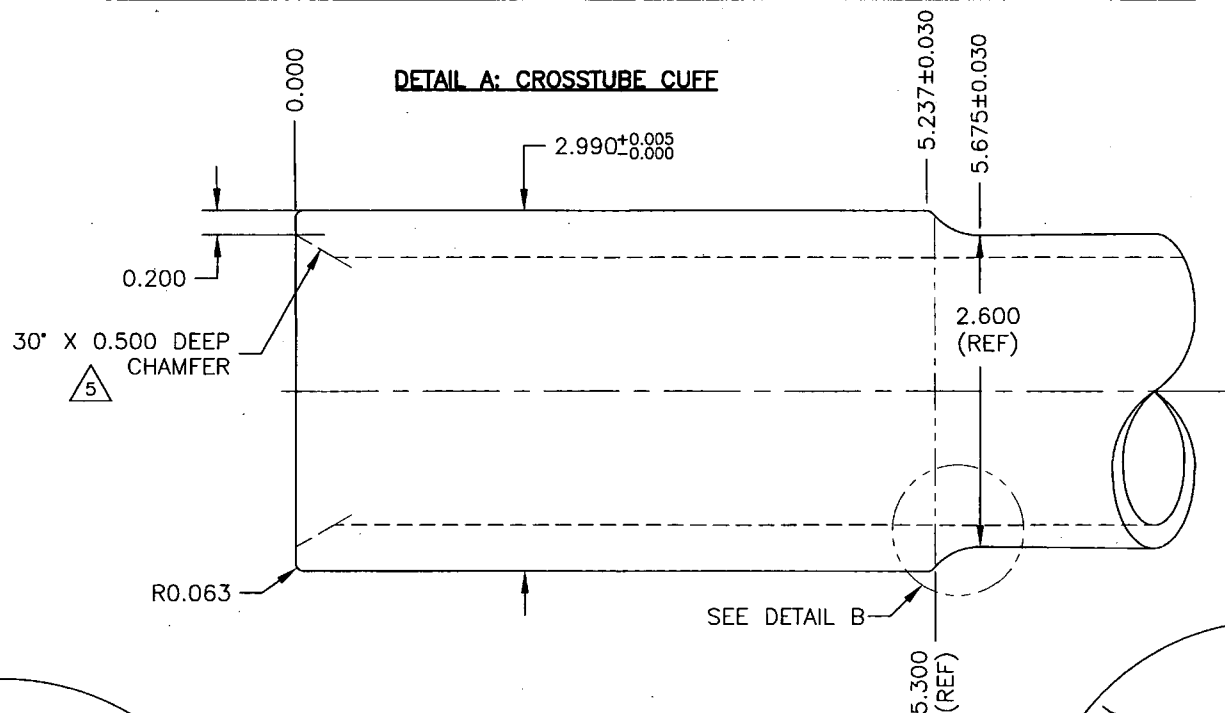


TITLE	SCALE
CROSSTUBE ASS'Y (205/212 HI AFT)	1:10

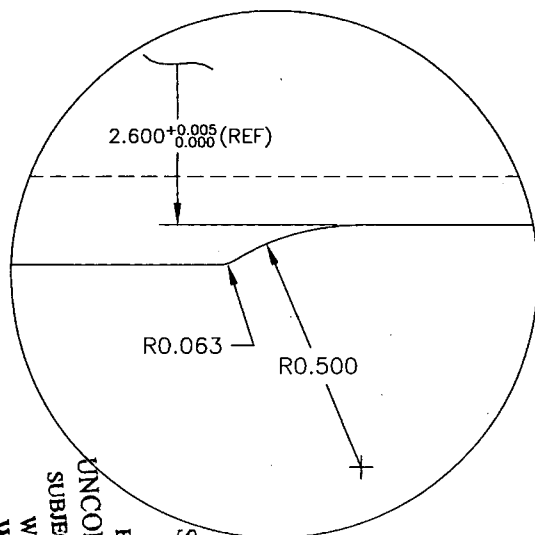
SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 39746

**RELEASED**  
 07.04.24  
 PER ECN 869

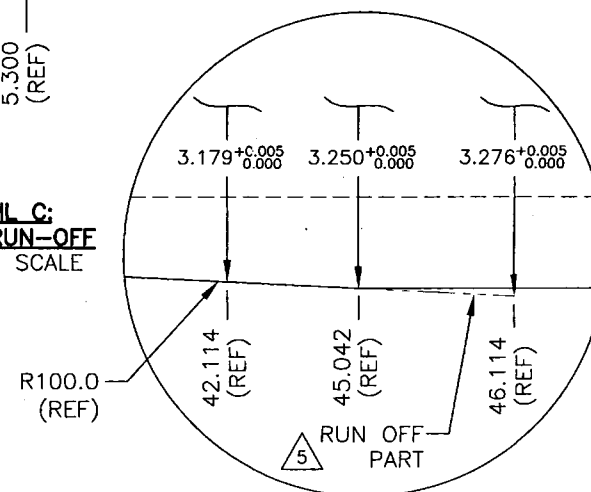
**DETAIL A: CROSSTUBE CUFF**



**DETAIL B: CUFF  
TRANSITION**  
 SCALE 4:1



**DETAIL C:  
TAPER RUN-OFF**  
 NOT TO SCALE



COPYRIGHT © 2000 BY DART AEROSPACE LTD.

THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL  
 AND IS SUPPLIED ON THE EXPRESS CONDITION  
 THAT IT IS NOT TO BE USED FOR ANY PURPOSE  
 OR COPIED OR COMMUNICATED TO ANY OTHER  
 PERSON WITHOUT WRITTEN PERMISSION FROM  
 DART AEROSPACE LTD.

DESIGN PH	DRAWN BY PH	<b>DART</b>	DART AEROSPACE LTD. HAWKESBURY, ONTARIO, CANADA
CHECKED [Signature]	APPROVED [Signature]	DRAWING NO. D212-664-241	REV. C SHEET 3 OF 3
DATE 07.03.08	TITLE CROSSTUBE ASS'Y (205/212 HI AFT)	SCALE 1:1	

NO. 2746  
 WORK ORDER  
 WITHOUT NOTICE  
 SUBJECT TO AMENDMENT  
 UNCONTROLLED COPY  
 ENGINEERING  
 RETURN TO  
 SHOP COPY



EXCERPT FROM  
SIZ-D212-664-1 Rev A

SECTION	Cross tube	Damage Tolerance	O.D. (in)	I.D. (in)	Area (in <sup>2</sup> )	Inertia (in <sup>4</sup> )
A-A	Bell Aft	0.000	3.250	2.220	4.425	4.284
	Bell Aft w/ dam. tol.	0.005			4.415	4.258
	Dart Aft	0.000	3.249	2.220	4.420	4.277
	Dart Aft w/ dam. tol.	0.015			4.278	4.053
B-B	Bell Aft	0.000	3.184	2.220	4.091	3.853
	Bell Aft w/ dam. tol.	0.005			4.081	3.827
	Dart Aft	0.000	3.178	2.220	4.062	3.815
	Dart Aft w/ dam. tol.	0.015			3.862	3.619
C-C	Bell Aft	0.000	3.027	2.220	3.326	2.929
	Bell Aft w/ dam. tol.	0.005			3.316	2.906
	Dart Aft	0.000	3.020	2.220	3.292	2.891
	Dart Aft w/ dam. tol.	0.015			3.093	2.703
D-D	Bell Aft	0.000	2.944	2.220	2.936	2.495
	Bell Aft w/ dam. tol.	0.005			2.926	2.473
	Dart Aft	0.000	2.937	2.220	2.904	2.460
	Dart Aft w/ dam. tol.	0.015			2.705	2.308
E-E	Bell Aft	0.000	2.776	2.220	2.182	1.723
	Bell Aft w/ dam. tol.	0.012			2.158	1.677
	Dart Aft	0.000	2.769	2.220	2.151	1.693
	Dart Aft w/ dam. tol.	0.015			1.952	1.516
F-F	Bell Aft	0.000	2.693	2.220	1.825	1.389
	Bell Aft w/ dam. tol.	0.012			1.801	1.346
	Dart Aft	0.000	2.686	2.220	1.796	1.363
	Dart Aft w/ dam. tol.	0.015			1.596	1.189
G-G	Bell Aft	0.000	2.593	2.220	1.410	1.027
	Bell Aft w/ dam. tol.	0.012			1.386	0.986
	Dart Aft	0.000	2.599	2.220	1.434	1.047
	Dart Aft w/ dam. tol.	0.015			1.235	0.877
H-H	Bell Aft	0.000	3.000	2.220	3.198	2.784
	Bell Aft w/ dam. tol.	0.030			3.138	2.649
	Dart Aft	0.000	2.990	2.220	3.151	2.731
	Dart Aft w/ dam. tol.	0.038			2.906	2.441

DART OD  
REDUCED BY  
0.001"

UP 08.06.13

SECTION **	Cross tube	Bending Ultimate (lb*in)	Bending Yield (lb*in)	Tension Ultimate (lb)	Tension Yield (lb)	Shear Ultimate (lb)
A-A	Bell aft w/ DT	172932	146731	291391	247241	185430
	Dart aft w/ DT	192122	164676	329372	282319	175380
	Margin of Safety	0.11	0.12	0.13	0.14	-0.05
B-B	Bell aft w/ DT	158673	134631	269379	228564	171423
	Dart aft w/ DT	175382	150327	297403	254917	158357
	Margin of Safety	0.11	0.12	0.10	0.12	-0.08
C-C	Bell aft w/ DT	126722	107522	218832	185676	139257
	Dart aft w/ DT	137818	118130	238180	204154	126823
	Margin of Safety	0.09	0.10	0.09	0.10	-0.09
D-D	Bell aft w/ DT	110902	94099	193142	163878	122909
	Dart aft w/ DT	121020	103731	208279	178525	110902
	Margin of Safety	0.09	0.10	0.08	0.09	-0.10
E-E	Bell aft w/ DT	79720	67641	142406	120829	90622
	Dart aft w/ DT	84323	72277	150306	128834	80033
	Margin of Safety	0.06	0.07	0.06	0.07	-0.12
F-F	Bell aft w/ DT	65973	55977	118876	100864	75648
	Dart aft w/ DT	68160	58422	122925	105364	65454
	Margin of Safety	0.03	0.04	0.03	0.04	-0.13
G-G	Bell aft w/ DT	50218	42609	91475	77615	58211
	Dart aft w/ DT	51963	44540	95119	81530	50648
	Margin of Safety	0.03	0.05	0.04	0.05	-0.13
H-H	Bell fwd w/ DT	116546	98888	207097	175718	131789
	Dart fwd w/ DT	125742	107779	223734	191772	119131
	Margin of Safety	0.08	0.09	0.08	0.09	-0.10

MARGINS  
STILL POSITIVE

CP

08.06.13